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## Navy Researchers Develop Model — Predict Limb Salvage in Seriously Injured

SILVER SPRING, Md.— Researchers from the Naval Medical Research Center (NMRC), along with colleagues from the Walter Reed National Military Medicine Center and the Uniformed Services University of Health Sciences in Bethesda, Md. recently published a paper in the November issue *Clinical Orthopaedics and Related Research* on a new computer model to predict limb salvage in severely injured warfighters.

This model is focused on patients who sustained high-energy injuries in a combat environment and had large soft tissue wounds and damage to other organ system.

Open calcaneus fractures, broken bones that break through the skin, take a longer time to heal because of the higher risk for

complications and often include more damage to the surrounding muscles, ligaments, and tendons and require surgery. When deciding whether to proceed with limb salvage or to perform an amputation the surgeon may choose to use a clinical decision support tool to estimate the patient's risks. Yet there are few tools to assist in predicting the outcome of this difficult fracture pattern.

The researchers developed and compared two decision support tools, an artificial neural network and a conventional logistic regression model, based on injury-specific data collected from wounded active-duty service members who sustained combat related open calcaneus fractures between 2003 and 2012. The goal was to

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SAN DIEGO Members of the Naval Medical Center San Diego (NMCSD) wheelchair basketball team, Wolfpack, do pace drills during a team practice. Made up of 13 military and civilian members, Wolfpack is one of 10 teams in the West Coast Conference of the National Wheelchair Basketball Association. Their record is 8-2. (U.S. Navy photo by Mass Communication Specialist 2nd Class John Philip Wagner/Released)

## NMRC Commanding Officer's Message

The outstanding science we do as part of Navy Medicine's research and development enterprise makes our military, the U.S. and the world safer and stronger. Tens of thousands of America's finest young men and women are stationed in the U.S or deployed around the world with boots on the ground or aboard ships, submarines, and aircraft. They depend on us. The research we do every day is having a direct impact on the health and medical readiness of these Sailors and Marines. CY 2013 brought many successes. Here are just a few examples: Our research into the health and readiness of servicewomen who are serving aboard submarines for the first time or preparing for combat assignments; our surgeon scientists' significant advances in acute trauma care in operational settings and at our MTFs; our work in understanding and treating severe head injuries; our infectious disease vaccine research milestones and our major role in supporting global influenza surveillance. Our primary focus is on the warfighters but we also contribute to the public health of the U.S. and of countries and regions around the world. One example is our OCONUS laboratories assistance in capacity building efforts supporting our allies and partners that contributes to the public health of countries and regions around the world, all in keeping with the tenants of the maritime strategy. Our research teams have also supported Navy Medicine's responsive and proactive role in humanitarian assistance and disaster relief efforts. As we move forward into the new year, we need to recognize that there are going to be budgetary challenges, but we will not be distracted by them. I also know we will stay on course and get the job done and always be ready to meet the health and medical readiness needs of our Sailors, Marines, Soldiers and Airmen by focusing on Vice Adm. Matthew L. Nathan's priorities of readiness, value and jointness. Our focus is always on our warfighters.



NMRC Commanding Officer sends,  
John. W. Sanders III, CAPT, MC, USN

## NMRC Director, Field Operations

Navy Medicine operates overseas infectious disease research commands in Cairo (NAMRU-3, with a field site in Accra, Ghana), Singapore (NAMRU-2/NMRC-Asia, with a field site in Phnom Penh, Cambodia), and Lima (NAMRU-6, with a field site in Iquitos, Peru). The mission of these labs and the Army overseas labs in Nairobi and Bangkok is, "To identify infectious disease threats of military and public health importance and to develop and evaluate interventions and products to mitigate those threats." While this mission statement was agreed on just a few years ago, it echoes a 1962 Institute of Defense Analysis review of medical and biological programs within the DoD that concluded, "Effective national defense demands a strong and comprehensive program in medicine and biology within the defense establishment ... The effects of extremes of climatological and disease environments in the remote areas of the world must be understood and dealt with in order to maintain an effective mobile force. The success of future operations may well depend on the ability to understand and deal with these problems through an adequate military biomedical program". The location of the three OCONUS labs and their principal field sites on three continents and in climatic conditions ranging from tropical rain forests, to coastal and inland deserts are ideally suited to the study of the widest range of potential infectious disease threats to operational forces. The NAMRU staffs conduct collaborative research and surveillance activities with regional and national public health agencies, and are able to work with health officials from neighboring countries. Despite the amazing advances in medical sciences, emerging and re-emerging infectious diseases remain as great, and perhaps an even greater threat to our operational forces and national security than they were in 1962 when the Institute of Defense Analysis established their rationale for the study "disease environments in remote regions of the world". With the realization in recent years that the soft diplomacy of public health capacity building in the developing world should be a significant component of our national security strategy, the OCONUS labs are perhaps more relevant now than they have been in the past.



Stephen. E. Walz, MPH, PhD

## Naval Health Research Center's Adenovirus Surveillance Program and the Return of Adenovirus Vaccine

SAN DIEGO - Adenovirus is a respiratory disease that commonly affects military recruits at basic training centers due to their relatively close living quarters, environmental factors, and the physical demands and stresses of boot camp. At the Naval Health Research Center (NHRC), the Department of Operational Infectious Diseases has conducted adenovirus surveillance for over 17 years as part of a larger febrile respiratory illness (FRI) surveillance effort among recruits at eight training centers in the U.S. This multi-service surveillance program has allowed NHRC to closely monitor the impact of the virus and highlight the importance of the vaccine in reducing adenovirus infection and overall FRI rates among recruits.

DoD developed live, attenuated oral vaccines against types 4 and 7 in the early 1970's that were successful in greatly reducing respiratory morbidity at basic training centers after introduction. In 1996, adenovirus vaccine production by the sole manufacturer ended. When a military order rationed the remaining adenovirus vaccine stockpile to be used only during winter months, NHRC saw adenovirus rates increase significantly. Rates increased even further when stockpiles ran out completely. The increased number of adenovirus cases cost the U.S. government a significant amount of money in medical care, lost recruit training time, and infection of new recruits entering training.

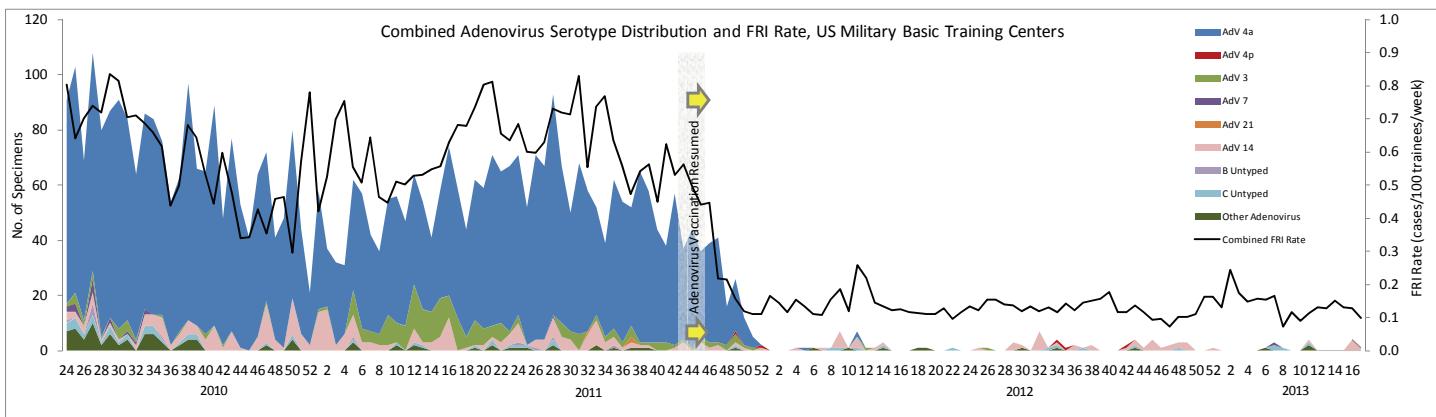
As it became clear that adenovirus had become re-established at the training



*GREAT LAKES (Nov. 2, 2013) Seaman Recruits perform sit ups during a Captain's Cup at Recruit Training Command (RTC). Recruit divisions compete against each other in ten different events to earn the Captain's Cup trophy and to have the opportunity to display the Captain's Cup flag at their pass-in-review. (U.S. Navy photo by Lt. j.g. Adam Demeter/Released)*

centers, the U.S. Army contracted Barr Pharmaceuticals in 2001 to develop and produce a new adenovirus vaccine to replace the old one. In order to receive FDA-approval of this new oral adenovirus type 4 and 7 vaccine, the Navy and Army conducted a phase III, double-blind, placebo controlled clinical trial at the basic training centers in Ft. Jackson, S.C. and Naval Station Great Lakes, Ill. This trial found the vaccine had high efficacy (99%) and a good safety record in the study population.

Resumption of the vaccine at all basic training centers occurred in October and November of 2011. By 2012, NHRC found adenovirus rates had plummeted, giving evidence to the success and value of the new vaccine and the importance of continuing vaccine production in the future. Ongoing adenovirus surveillance at NHRC will continue to monitor FRI and adenovirus rates, paying particular attention to any rate increases of adenovirus types not included in the vaccine.



## Researchers Participate in International Workshop on Military Traveler's Diarrhea

SILVER SPRING, Md. – Three researchers from the Naval Medical Research Center (NMRC) presented information on the impact of diarrhea on deployed warfighters.

Cmdr. Mark Riddle, Cmdr. Ramiro Gutierrez, and Dr. Chad Porter, from NMRC's Enteric Diseases Department, traveled to the Royal Military Academy in Sandhurst, England to participate in an inaugural workshop aimed at identifying common gaps in knowledge of disease burden, prevention and treatment strategies for military traveler's diarrhea. Other participants included military and civilian representatives from the United Kingdom, Belgium, France, Germany, and the Netherlands.

The meeting was sponsored by the World Health Organization (WHO) and the International Committee of Military Medicine (ICMM) and included presentations by experts on epidemiology, microbiology, and clinical management of diarrheal disease in military populations. Additionally, workshop participants began the process of identifying standards for disease surveillance, as well as drafting joint statements on case definitions, laboratory diagnostics, and research priorities in an effort to chart a way forward on joint collaborative efforts.



*Cmdr. Mark Riddle presents research information at the Royal Military Academy in Sandhurst, England as part of the inaugural workshop on Military Traveler's Diarrhea.*

Riddle provided an overview and historical background on military travelers' diarrhea to include the continued lack of effective field diagnostics and impact on fighting forces from World War II to the present. Porter reviewed emerging data on increasingly recognized and costly long-

term consequences of acute infectious diarrhea such as functional bowel disorders and reactive arthritis. Gutierrez discussed existing management challenges in the treatment and prevention of travelers' diarrhea.

*(Continued on page 5)*

## The International Committee of Military Medicine

Founded in 1921, the International Committee of Military Medicine (ICMM) is a nonpolitical organization which facilitates the sharing of military medical knowledge and cooperation between health services members worldwide. The main objective of the ICMM is to ensure medical services personnel have the means to work together, using similar practices, in operations involving international cooperation.

In 1920, after World War I revealed the lack of care given to the victims and the

importance of the need for closer cooperation between Armed Forces Medical Services worldwide, Capt. William S. Bainbridge, MD, (U.S. Navy) and Commander Medical Officer Jules Voncken (Belgium) suggested the creation of an international organization of the Armed Forces Medical Services at the 28th session of the U.S. Military Medical Officers Association (AMSUS).

The first International Congress of Military Medicine and Pharmacy was held in 1921 in Brussels. It resulted in a permanent Committee of International

Congresses of Military Medicine and Pharmacy (ICMPM) being officially founded in 1921. The founding countries were Belgium, Brazil, France, Great Britain, Italy, Spain, Switzerland and the United States.

In 1952, an agreement of cooperation was signed with the World Health Organization (WHO) who recognized the Committee as an "international body specialized in medico-military matters". In 1990, the Committee changed its name and became the International Committee of Military Medicine.

# Navy Unit Conducts Medical Training with Peruvian Navy

By Mass Communication Specialist 2nd Class Adam Henderson, 4th Fleet Public Affairs

CALLAO, Peru (NNS) -- The U.S. Naval Medical Research Unit in Peru (NAMRU-6) held a medical conference Nov. 18-29, 2013, focusing on HIV/AIDS/STI Program Monitoring and Evaluation in partner nations.

## **NAMRU-6 conducts infectious disease research and surveillance that is of military and public health concern in the region. The research covers a wide spectrum of topics including entomology, bacteriology, virology, emerging infections, and parasitology.**

The two-week course was attended by military health personnel from Peru, Colombia, Dominican Republic and NAMRU-6. The command has the distinction of being the only U.S. military command in South America, part of U.S. Naval Forces Southern Command/U.S. 4th Fleet(USNAVSO/C4F) area of operations (AOR).

Navy Capt. Christine Dorr, fleet surgeon for USNAVSO/C4F, talked about the importance of working with partner nations.

"NAMRU-6 is a leader in HIV/AIDS and public health research in the 4th Fleet AOR," said Dorr. "It is wonderful that such expertise and best practices is shared,

since these disease threats don't care about country borders or alliances. Responses to pandemics and other prevalent infections disease epitomize the phrase 'united we stand, divided we fall.'

"HIV/AIDS can and has had a significant destabilizing effect on security around the world as large percentages of the population have been infected and is contributing factor to regional instability, as we have seen in Sub-saharan Africa. While not as extreme, HIV/AIDs remains a significant public Health issue in the Caribbean and South America."

The Peruvian navy sponsored the event with support from U.S. Southern Command (SOUTHCOM) in coordination with the partner nations.

Dr. Ricardo A. Hora, department head of the Biomedical Informatics Unit of the Emerging Infections Department of NAMRU-6 attended the course and was pleased with the number of participants.

"The attendance was what we had anticipated. The attendees' attitude and participation were remarkable, which helped make the course more interactive," said Hora.

NAMRU-6 is comprised of 14 active duty service members from the Navy, Air Force and Army and 320 Peruvian scientists.

Army Col. Rudy Cachuela, SOUTHCOM surgeon discussed the benefit of participating in the course.

"With everything going on in our AOR, having forces that are ready to conduct missions, contingencies or exercises only enhances our ability to cooperate with our partner nations, here at SOUTHCOM," said Cachuela. "The benefit of this training is to make sure we are teaching them full health protection techniques, so their ability to maintain mission capable forces, to work together and accomplish the different missions in the SOUTHCOM AOR."

Navy Medicine is a global health care network of more than 63,000 Navy medical personnel around the world who provide high quality health care to more than one million eligible beneficiaries. Navy Medicine personnel deploy with Sailors and Marines worldwide, providing critical mission support aboard ship, in the air, under the sea and on the battlefield.

U.S. Naval Forces Southern Command and U.S. 4th Fleet employ maritime forces in cooperative maritime security operations in order to maintain access enhance interoperability and build enduring partnerships that foster regional security in the U.S. Southern Command Area of Responsibility.

## International Workshop on Military Traveler's Diarrhea

(Continued from page 4)

International presentations also included reviews of unpublished data on the epidemiology of diarrheal outbreaks in recent military operations carried out by the French and German forces in Africa.

Over several years, NMRC has been working closely with the UK Enteric Diseases Research Group led by Colonel Patrick Connor on joint research and epidemiology which have culminated in the execution of two cohort studies, one ongoing randomized controlled trial on

travelers' diarrhea treatment in deployed UK and U.S. military personnel in Africa and the Middle-East, as well as a planned multi-site rifaximin chemoprophylaxis field trial.

This meeting brought other partner military medical experts with similar interests together to discuss common challenges and needs in the research and management of travelers' diarrhea.

The NMRC Enteric Diseases Department's research program is centered on the development of effective

countermeasures to prevent or abate diarrhea, with most efforts aimed at vaccine research and development. The department is organized into four closely integrated branches: molecular biology, immunology, biochemistry and clinical trials.

**Infectious diarrhea has historically been a substantial cause of morbidity for deployed U.S. military personnel and continues to the present day.**

## NHRC Scientist Assists Research Team Studying TBI and the Risk of PTSD

SAN DIEGO – Naval Health Research Center (NHRC) scientist, Dr. Jerry Larson, collaborated on an innovative study investigating the association between traumatic brain injury (TBI) and the risk of post-traumatic stress disorder (PTSD) over time.

The team was led by researchers from the Veterans Affairs San Diego Healthcare System and the University of California, San Diego School of Medicine.

Larson, along with the other investigators, deliberated on numerous issues that are fundamental to the design of a robust PTSD study. For example, contrary to common perceptions most military research samples include substantial numbers of individuals who report no (zero) PTSD symptoms at all. Because zero-scores create a pronounced skew that is problematic for many conventional statistical techniques, the research team eventually gravitated toward a rare method call Zero-inflated Negative Binomial Regression (ZINBAR) as part of a combination of approaches.

The novelty of ZINBAR was noted by scientific reviewers at JAMA Psychiatry, where the work was recently published.

In addition, the research team had to grapple with the always contentious question of how to define PTSD. While this issue may seem like one that should be straightforward, strong arguments have been made for both liberal and conservative PTSD definitions. The choice has many implications, including PTSD prevalence estimates emerging from the study. Once an evidence-based PTSD criterion was decided upon, analyses were able to proceed.

Subsequently, the investigators reported that TBIs suffered during active-duty deployment to Iraq and Afghanistan were the greatest predictor for PTSD. However, pre-deployment PTSD symptoms and high combat intensity were also significant factors.

The findings indicate that screening for deployment-related TBIs is an effective way to identify service members at heightened risk for PTSD. The findings

are published in the December 11, 2013 only issue of JAMA Psychiatry.

**Larson and other NHRC scientists are currently engaged in further analyses with the same research subjects to clarify additional risk factors for stress injuries during deployment.**

NHRC works closely with operational units by conducting medical modeling and simulation analysis; monitoring the effects of combat exposure on psychological health; managing career-span deployment health and readiness programs, improving warfighter performance, and assisting in the implementation of military-specific HIV prevention programs around the world. With its strategic location within the fleet concentration area of San Diego, NHRC is uniquely positioned to respond to the biomedical research requirements of the expeditionary forces of all the services and special operations communities.

## Researchers Predict Limb Salvage in Seriously Injured

*(Continued from page 1)*

determine which model more accurately estimated the likelihood of amputation.

"We designed an artificial neural network to estimate the likelihood of successful limb salvage using patient injury data from 155 combat-related open calcaneus fractures," said Cmdr. Jonathan A.

Forsberg, Head of the NMRC Regenerative Medicine Department and an Associate Professor of Surgery at the Uniformed Services University. "The accuracy of the artificial neural network was found to be 30 percent higher than the logistic regression mode. Our analysis suggested that the artificial neural network was perhaps better suited for clinical use."

Forsberg added, "Blast injuries are devastating injuries that are notoriously difficult to treat." Their research determined that the artificial neural network, a bioinformatics tool using eight injury-specific features, was capable of accurately estimating the likelihood of amputation.

This tool has the potential to provide a surgeon the ability to focus surgical interventions, avoid unnecessary treatments, and counsel patients more appropriately earlier in the course of their treatment. Though this research is promising, additional validation studies need to be conducted to determine the possibility of wider clinical use.

NMRC's Regenerative Medicine Department is committed to cutting-edge

translational research and personalized medicine. The mission of the department is to understand the response to injury and develop improved diagnostics, therapeutics, and decision-support tools for combat-related injuries. The unique collaboration between physicians, scientists, engineers, and mathematicians enables the team to bring a broad variety of expertise to bear in an effort to solve important but difficult clinical problems. Working with the Department of Surgery at the Uniformed Services University, the Walter Reed National Military Medical Center, and civilian academic partners, the team conducts translational research from the battlefield to the bedside that is designed to benefit the wounded warfighter.

## Blood Substitutes Show Promise for Battlefield Resuscitation

By Bjorn Song, PhD, NAMRU-SA

SAN ANTONIO - Hemorrhage is one of the most preventable forms of military casualty, with survival being dependent on prompt hemorrhage control and restoration of both fluid volume and oxygen carrying capacity. Oxygen therapeutics (OTs), also known as blood substitutes, have several attributes making them an ideal choice for pre-hospital resuscitation. Blood substitutes behave as plasma expanders and have an oxygen carrying capacity that is greater than crystalloids and colloids. Unlike blood, OTs can be stored at room temperature, and have a shelf life of up to five years.

Since OTs are extracellular agents, they have universal applicability and do not require blood typing. From a public health stand point, there is a significantly lower risk of the transmission of blood borne diseases.

The Naval Medical Research Unit –San Antonio (NAMRU-SA) is currently investigating these new forms of OTs. In an effort to down-select from among several varieties of OTs, a top-load *in vivo* model was utilized in the first phase to establish a dose response relationship as well as evaluate the cumulative dose effect. Vasoactivity was measured



Dr. Bjorn Song conducts a test analyzing oxygen therapeutic agents as part of his research at the Naval Medical Research Unit San Antonio.

systemically, i.e. blood pressure, via an arterial catheter, while it was also monitored at the microcirculation level where vessel diameter changes were recorded. Other physiological parameters were also measured to assess the efficacy of these OTs, such as cardiac output and functional hemoglobin content.

There were no significant adverse effects reported using this model, and the tested

OTs have been recommended for evaluation in a more clinically relevant hemorrhagic shock model. Further research is warranted as there is a demand to identify a safe and beneficial pre-hospital oxygen carrying resuscitation solution that could save the lives of military personnel in austere and combat environments.

## Identification of Bacterial Agents Will Aid Combat Casualties

By Rene Alvarez, PhD, NAMRU-SA

SAN ANTONIO—The Naval Medical Research Unit San Antonio (NAMRU-SA) Immunodiagnostics Department conducted a study to evaluate the utilization of Surface Enhanced Raman Spectroscopy (SERS) for detection and generation of “molecular fingerprints” of military relevant infectious organisms.

According to the Joint Theater Trauma Registry, approximately 25 percent of combat casualties are found to develop an infection, with the rate approaching 50 percent in wounded warriors requiring intensive care treatment.

Infections are commonly associated with methicillin-resistant *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Acinetobacter baumannii*, *Escherichia coli*, and *Klebsiella Pneumoniae*.

These infections result in extensive medical complications and negative outcomes for patients. Antibiotic prophylaxis has been a standard of care, however successfully treating infection depends on a complete understanding of the bacteria present in and around the wound. A rapid and sensitive means of diagnosing bacterial agents is critical for accurate and successful infection care.

A total of sixteen isolates including six *A. baumannii*, four *S. aureus*, three *K. pneumonia*, and three *P. aeruginosa* strains were evaluated by SERS to determine uniqueness and commonalities of each spectra. NAMRU-SA’s data demonstrate that SERS could generate unique “molecular fingerprints” for these organisms in 15 – 30 seconds.

All data were confirmed by utilization of organism specific quantitative real-time PCR amplification. These data demonstrate the potential value for the use of SERS-based platforms for rapid detection of microorganisms.

# Navy Researchers Support Influenza Surveillance Network in West Africa

From NAMRU-3 public affairs

CAIRO - The U.S. Naval Medical Research Unit No. 3 (NAMRU-3) is laying the groundwork for a more robust influenza surveillance network in West Africa in partnership with the WHO and CDC. With funding from Global Emerging Infections Systems (GEIS), NAMRU-3 helped establish a National Influenza Center (NIC) at the Institut Pasteur in Abidjan, Côte d'Ivoire.

Lt. Cmdr. Gabriel Defang, NAMRU-3's head of the Viral and Zoonotic Disease Research Program, and his team focused on mil-mil cooperation with the National Armed Forces of Côte d'Ivoire (NAFCI) Health Services. Their efforts included human and avian respiratory disease surveillance in NAFCI active duty personnel and backyard poultry in the military camps.

The team also explored opportunities to support integrated respiratory disease surveillance at the national public health laboratory. Defang met with the NAFCI Surgeon General, Medicin Général de Brigade Kouame Akissi to discuss integrating military influenza surveillance with the national influenza surveillance network (NISN). Akissi approved the establishment of three medical and veterinary sentinel sites.

In other meetings with the Côte d'Ivoire Ministries of Defense and Health, Defang secured approval for the military hospitals and labs to send samples to the NIC, as well as provide data from the civilian population for weekly WHO reporting. The combined data more accurately reflects what is actually happening in the country.



*Surgeon General of the National Armed Forces of Côte d'Ivoire (NAFCI), Medicin Général de Brigade Kouame Akissi (center) with Lt.Cmdr. Gabriel Defang (right) following a meeting on disease surveillance in the NAFCI. Photo by Côte d'Ivoire Ministry of Defense staff member.*

"It is important to consider the military's role in pandemic preparedness plans beyond its traditional peacekeeping role. In conjunction with the U.S. Defense Attaché to Côte d'Ivoire, NAMRU-3 facilitated the involvement of the Ministry of Defense as public health partners. NAMRU-3 is ready to assist the military hospitals and labs improve their capacity for pandemic preparedness," said Defang. The team also assessed the NIC laboratory at the Institut Pasteur and provided virus isolation and troubleshooting training to four personnel in the influenza laboratory; the training was critical in maintaining the functions of the NIC lab.

Finally, Defang, along with staff from the CDC and the National Institute for Public Health in Côte d'Ivoire provided a three-day training course to Ivorian and ten other West African laboratorians and epidemiologists on data analysis and scientific writing to enable these countries to publish their scientific data in international peer-reviewed journals.

"NAMRU-3 is committed to its role in equipping laboratories and training medical personnel in developing countries. This is critical to strengthening global health security in a more interconnected world," said Defang.

## Check out NMRC's Recent Blogs on Navy Medicine Live

### The War Against Infectious Diseases

<http://navymedicine.navylive.dodlive.mil/archives/5914>

### Surgeon General's Corner: Navy Medicine's Role in Global Heath Engagement

<http://navymedicine.navylive.dodlive.mil/archives/5906>

## NAMRU-3 Assists Liberia to Prevent Spread of Lassa Fever

*From NAMRU-3 public affairs*

CAIRO – The U.S. Naval Medical Research Unit No. 3 (NAMRU-3) assisted in a health and hygiene barracks inspection with the Armed Forces of Liberia (AFL) Preventive Health Team and the Medical Team from Operation Onward Liberty (OOL), in September 2013, after 14 Lassa fever virus deaths, including a civilian who lived immediately outside AFL Camp Tubman, located in central Liberia.

Lassa fever, a zoonotic virus, is transmitted to humans through the urine and feces of rodents. The inspection focused on mitigating any sanitary issues that may attract rodents into living spaces. Working with the AFL and OOL teams, Lt. Joseph W. Diclaro II, Head of the NAMRU-3 Vector Biology Research Program found the general sanitary practices in the base residences were very good.

"There haven't been any reports of Lassa fever among the AFL or the U.S. Forces at this time, which could be influenced by

how well they're maintaining good sanitary practices," Diclaro stated.

Currently there are no in-country diagnostics for this virus. Suspected Lassa fever samples are sent to either Sierra Leone or South Africa for testing, greatly delaying confirmation of cases.

The NAMRU-3 team, with support from Lt. Nehkoni Adams, Officer in Charge of NAMRU-3 Ghana Detachment, developed a procedure to send blood samples to NAMRU-3 Ghana Detachment for rapid analysis. This will assist the AFL and any U.S. Forces deployed to Liberia with force health protection measures.

**"This is only a temporary. Our plan is to provide training and diagnostic tools to give Liberia the ability to test for the Lassa fever virus by the end of 2014," said Lt. Cheryl Rozanski of the NAMRU-3 Viral and Zoonotic Disease Research Program.**



*AFL Preventive Medicine Techs Pfc. Morris and Pfc. Smith with Lt. Diclaro, conduct a health and hygiene inspection.*

"This is another great example of how NAMRU-3 projects medical diplomacy within the countries where we work. Our teams on the ground are available to assist with their expertise not only on research, but also to contribute to improvements in areas that may otherwise be lacking," said Capt. Buhari Oyofo, NAMRU-3 commanding officer.

## NMRC Seminar Series: First Malaria Vaccine Showing Protection

SILVER SPRING, Md. - Dr. Martha Sedegah, Director of the Clinical Immunology and Parasitology, Malaria Department provided an overview of the important studies of the department's vaccine development path, from the early-irradiated sporozoite vaccine studies to the gene-based vaccine studies in a laboratory models at the Naval Medical Research Center, October 18, 2013. She presented cutting-edge findings on protection against malaria induced by a gene based DNA prime-adenovirus boost vaccine and its association with focused CD8+ T-cell effector memory interferon-gamma (IFNg) responses to Class 1-restricted epitopes.

That work led to the current clinical development approach with the DNA prime and human adenovirus-vectored vaccine boost. The vaccine was given as three doses of DNA encoding two malaria antigens, the circumsporozoite protein

(CSP) and apical membrane antigen 1 (AMA1), followed by boosting with one dose of adenovirus serotype 5 containing same two antigens (DNA-AdCA). The trial induced sterile protection against controlled human malaria infection in four of the 15 immunized research subjects. A second trial involving the adenovirus component alone (AdCA) was not protective.

Sedegah compared T-cell responses induced in protected and non-protected subjects in the two trials in an effort to identify specific response patterns that were associated with protection. She found that while IFNg secreting CD8+ T cells were higher in protected than non-protected subjects in the DNA-AdCA trial, those induced in the AdCA alone trial were generally similar or higher in some subjects than protected subjects in the DNA-AdCA trial. Responses in the

protected subjects were qualitatively different and were focused on discrete regions of the vaccine antigens whereas responses induced in the high responding non-protected subjects were broad, targeting multiple regions of the vaccine antigens. NetMHC algorithms predicted that T cells from protected subjects bind to HLA A\*03 and HLA B\*58-restricted epitopes within the focused regions, whereas most of the non-protected subjects' T cells were predicted to bind other class 1 epitopes restricted by other HLA alleles. The two A\*03 and B\*58 predicted epitopes recalled CD8+ T-cell effector memory IFNg responses in the protected volunteers.

This is the first report of a malaria vaccine that has induced protection in humans involving responses that specifically recognize HLA class 1-restricted epitopes.

## A Day of Remembrance at Arlington National Cemetery

NMRC volunteers helped to unload trucks and lay wreaths at Arlington National Cemetery, December 14, 2013, on National Wreaths Across America Day. Lt. James Regeimbal (left), Lt Jacob Norris (below) and Lt. Jose A. Garcia (inset) joined others to lay over 140,000 remembrance wreaths throughout the cemetery. Arlington was one of over 800 locations

nationwide saying *thank you* to our veterans and their families for all they sacrifice for our freedoms. They were part of the 22nd annual "Wreaths Across America" event. Out of the backs of several tractor-trailer trucks, volunteers passed the wreaths — Maine balsam with a hand-tied red bow — to the thousands of civilians, service members, adults and children who placed them in advance of the holiday season.



***R & D Chronicles:*****NAMRU-2 and the Cholera Epidemic of Saigon**

By André B. Sobocinski, Historian, Bureau of Medicine and Surgery (BUMED)

***Cholera is a killing disease. It strikes quickly, and if you don't get treatment quickly you die...Cholera is an intestinal disease.***

***It quickly attacks the body's organisms and causes acute uncontrollable diarrhea and great loss of body fluids...***

***Cholera is also a highly contagious.***

~Voice of America Radio Documentary on Cholera (February 18, 1964)

Under the guidance of pioneering scientist Capt. Robert Phillips, the U.S. Naval Medical Research Unit No. 2 (NAMRU-2) in Taipei, Taiwan, honed an international reputation for its fight against parasitic diseases, most notably cholera.

During cholera epidemics in India, Pakistan, Thailand and the Philippines, NAMRU-2 scientists saved untold lives by treating victims with a saline-based rehydration therapy developed by Phillips.

When Saigon was hit by a massive cholera outbreak in early January 1964, it was little surprise that South Vietnamese health officials called upon NAMRU-2 for assistance.

First identified at Saigon's Pasteur Institute January 7, 1964, the South Vietnamese cholera epidemic was one of the deadliest to hit Asia. Reported cholera cases in Saigon alone numbered over 4,000 and some medical authorities suspected that numbers of unreported cases in and around the city could have been three-fold and possibly up to one-third of Saigon's one-million people.

On Jan. 19, 1964, Phillips and his six-person team became the first foreign medical unit to arrive in Saigon during the epidemic. They established a base of



Capt. Robert Phillips checks progress of patients who have received his special treatment for cholera at a suburban Saigon hospital. (February 1964). BUMED Archives.

operations at the Cho Quan Infectious Disease Hospital where they were allotted 128-hospital beds and a medical laboratory.

Immediately, Phillips established a "demonstration team" to familiarize

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**NAMRU-3 Participates in Embassy Event**

CAIRO – The U.S. Naval Medical Research Unit No. 3 (NAMRU-3), along with several Embassy agencies, participated in a Disaster Preparedness and Crisis Event sponsored by the U.S. Embassy Accra, Ghana. This was an opportunity to highlight NAMRU-3 Detachment's mission in Ghana and its relationship to the U.S. Embassy there. The researchers can assist in rapid

diagnosis of certain diseases, coordinate transport of specimens to expedite testing and provide resources and establish communication with our collaborating partners. Allison Stanton, the Community Liaison Officer at U.S. Embassy Accra said the event improved interagency communications and awareness both for individual mission agency responsibilities and how they could best interact in case of a disaster.



## R & D Chronicles: NAMRU-2 and the Cholera Epidemic of Saigon



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Vietnamese medical personnel with his effective treatments.

Over the course of the next month, NAMRU-2 and Vietnamese medical personnel worked around the clock treating over 2,000 cases. The mortality rate was less than one percent. Phillips would later relate, "If it hadn't been for our operation perhaps eighty ...patients in our Saigon wards would have died of cholera. Maybe thousands more Vietnamese would have died of cholera in other parts of this town."

*In 1964, a medical team from U.S. Naval Medical Research Unit No. 2 (Taipei, Taiwan) travelled to Saigon to treat victims of the cholera epidemic. The medical team headed by pioneer scientist Capt. Robert Phillips, MC, USN, operated out of a suburban hospital where they treated over 2,000 cholera sufferers with rehydration therapy. (February 1964) BUMED Archives.*

## Greetings from the NMRC Ombudsman — New Year, New You!

I was reminded recently that the month of January takes its name from Janus, the ancient Roman god of beginnings and transitions. He is most often depicted with two faces as he looks to both the past and the future. The beginning of a new year is also a period of transition as we say good -bye to the past year's trials and successes and welcome the new year with hope and excitement of things to come.

In this period of transition, we often, myself included, set goals for the new year. Many New Year's resolutions are just a repeat of last year's: I'll work out more, lose 20 pounds, eat healthier, or start a new diet. Often, after about two weeks of trying, we give into old habits and fall off the proverbial bandwagon. This year however, instead of trying to stick to another boring New Year's resolution, I propose something a little different: **try something new for 30 days.**

There is a great TedX talk given a couple of years ago by Matt Cutts about creating new habits: [http://www.ted.com/talks/matt\\_cutts\\_try\\_something\\_new\\_for\\_30\\_days.html](http://www.ted.com/talks/matt_cutts_try_something_new_for_30_days.html).

In the talk, which is only 6 minutes, he explains how 30 days is the best length of time for either creating a new, good habit or getting rid of an old, bad habit. But this behavior experiment doesn't have to be just about extinguishing bad habits like not eating carbs for 30 days—please, someone bring me a baguette! No, it can be about trying something new, something you've always wanted to do- just for the next 30 days. Thus, rather than feeling like a chore, you are instead creating a unique and enriching life experience that you wouldn't have done had you just made that same old New Year's Resolution.

So I encourage you to watch the Ted Talk and then challenge yourself to try something you've always wanted to do for 30 days and watch the "new you" take form. Best wishes for a happy, healthy, and enriching new year!

Allison Norris

